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NEW GASTROPODS FROM THE BLANCO FORMATION (NEBRASKAN AGE, PLEISTOCENE) IN KANSAS

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Fossiliferous deposits in the Nebraskan Stage of the Pleistocene are known from the David City formation in northeastern Kansas (Doniphan County), from the Blanco formation in the south-central part of the State (Kingman County), and in several counties of the southwest, notably Meade and Seward. Molluscan faunas from sands and silts in these formations are being studied as part of a comprehensive investigation of the sequence of molluscan faunal assemblages in Pleistocene deposits in the midcontinent region, but particularly in Kansas. A distinctive molluscan faunal assemblage has been described from late Kansan or early Yarmouthian Stage of the Pleistocene sediments here (Frye, Swineford and Leonard, 1948; Leonard, 1950); distinctive molluscan faunal assemblages have been listed from Illionian and Wisconsinan stages of the Pleistocene in Kansas (Frye and Leonard, 1951); molluscan faunas have been utilized to zone stratigraphically the massive Peoria loess in the State (Leonard, 1951); and a detailed report of studies of the molluscan faunal assemblages in the Illinoian and Wisconsinan stages of the Pleistocene has recently been published (Leonard, 1952). A study of the mollusks in Pleistocene sediments of Nebraskan Age is now in progress.

Study of the fossil mollusks of Nebraskan Age in Kansas has resulted in the discovery of several undescribed kinds of gastropods in these sediments. It is the purpose of this paper to name, describe and illustrate these fossil gastropods.

AMNICOLA CRYBETES, new species. Plate 5, fig. A

Holotype.—Catalogue number 3805, Molluscan Collection, University of Kansas Museum of Natural History. Type and paratypes from type locality collected by C. W. Hibbard.

Horizon and type locality.—Blanco formation (Nebraskan Age, Pleistocene). Fifteen miles east of Liberal (center W line, sec. 36, T. 34 S, R. 31 W), Seward County, Kansas.

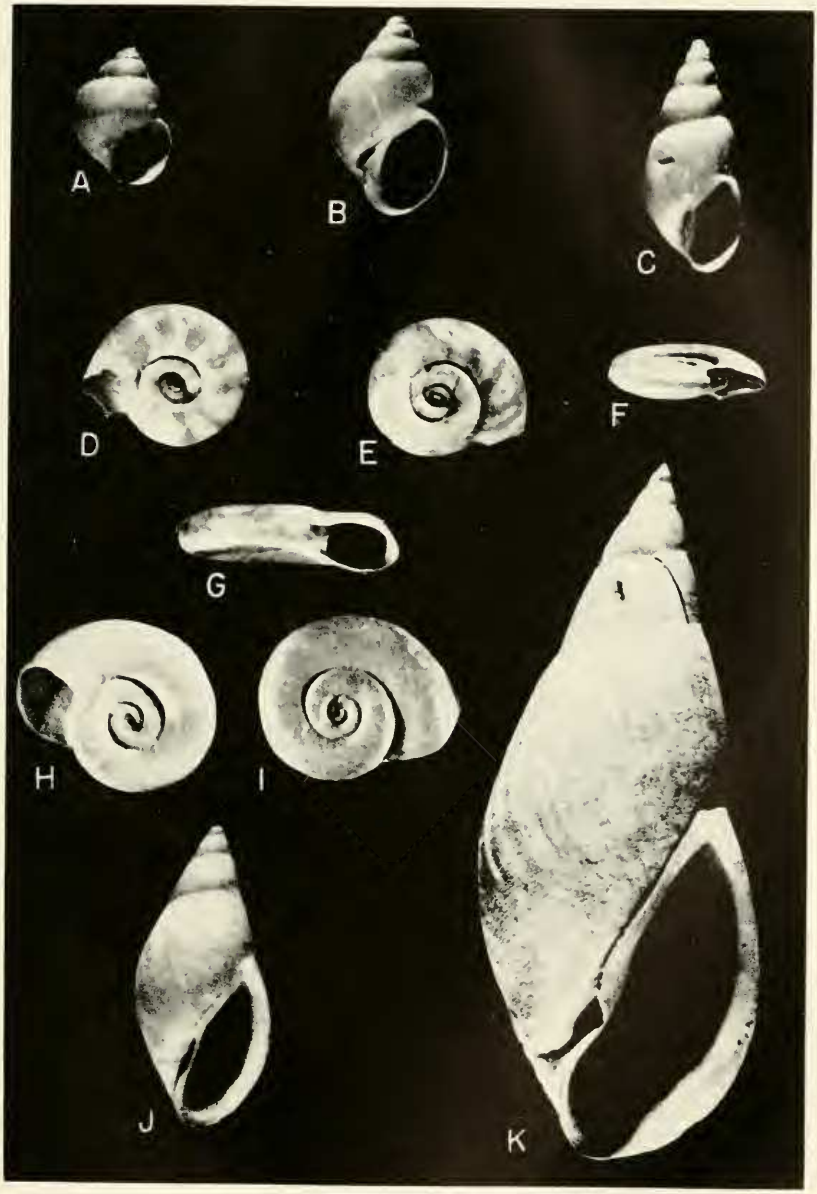
Diagnosis.—Shell small, a little more than 3 mm. high, broadly conic, perforate, whorls strongly convex, turreted, 5 in number, the last inflated; suture deeply impressed; first whorl subplanorbid.

Description of holotype.—Shell small, broadly conic, perforate; whorls 5 in number, strongly convex, increasing rapidly in diameter, the last inflated; suture deeply incised; apex not acute; first whorl subplanorbid; height of spire half that of shell; peristome continuous, not adnate to preceding whorl, broadly oval above, rounded below; lip thin, sharp, simple, somewhat reflected over the round umbilical perforation, but not closing it; nuclear whorl finely granular, remaining whorls with fine, raised, vertical lines, which at short intervals coalesce into low ridges of variable width; spiral lines wanting.

Comparisons.—*Amnicola crybetes* differs from *A. walkeri* in its larger size, less broadly conic outline, and greater number of whorls; it is smaller and more broadly conic than *A. lustrica.* Since it is impossible to determine the relationships of kinds of Amnicola from the shell alone, the true affinities of this species remain uncertain.

	Height	Diameter	Aperture height	Aperture width	Number of whorls
Type	3.33 mm.	2.25 mm.	1.55 mm.	1.35 mm.	5
Paratypes (no. 3806)	3.24 mm.	2.34 mm.	1.44 mm.	1.35 mm.	5
	3.33 mm.	2.34 mm.	1.53 mm.	1.35 mm.	5
	3.40 mm.	2.52 mm.	1.62 mm.	1.36 mm.	5
	3.35 mm.	2.45 mm.	1.50 mm.	1.37 mm.	5

The name *"crybetes"* is from the Greek word meaning "hidden in the earth."



Leonard: New Gastropods from the Blanco formation.

LYMNAEA DIMINUTA, new species. Plate 5, fig. B

Holotype.—Catalogue number 8801, Molluscan Collection, University of Kansas Museum of Natural History, Type and paratypes collected by A. B. Leonard and Alice E. Leonard.

Horizon and type locality.—Blanco Formation (Nebraskan Age, Pleistocene). Nine miles south, 7 miles west of Meade (SW ¼ sec. 22, T. 33 S, R. 29 W), Meade County, Kansas.

Diagnosis.—Shell small, approximately 5 mm. high, conic, with 5 moderately convex whorls, gradually enlarging, except the last which is greatly enlarged and ventricose; aperture broadly ovate; inner lip of peristome reflected upon, and adnate to the preceding whorl, leaving round umbilicus open by small chink.

Description of holotype.—Shell conic, of medium size for the genus; 5 moderately convex whorls, nuclear whorl planorbid, those of spire turreted, last greatly enlarged and ventricose; aperture broadly ovate, more than half as high as shell; outerlip of peristome simple, strongly convex; inner lip thin, upper part adnate to preceding whorl, lower part reflected over columella, without entirely closing round umbilicus; nuclear whorl smooth, remaining whorls with inconspicuous, raised, vertical striae; no spiral striae.

Comparisons.—*Lymnaea diminuta* seems to have derived from a stock of *L. humilis,* or at least to be related to it, but it does not intergrade with it in the known populations. *Lymnaea diminuta* is quite unlike the other small Lymnaeas, such as *L. parva* and *L. dalli.*

	Height	Diameter	Aperture height	Aperture width	Number of whorls
Type	5.2 mm.	2.9 mm.	2.9 mm.	2.0 mm.	5
Paratypes (no. 3774)	5.1 mm.	2.6 mm.	2.2 mm.	1.8 mm.	5
	4.3 mm.	2.4 mm.	2.3 mm.	1.8 mm.	5
	4.2 mm.	2.5 mm.	2.3 mm.	1.5 mm.	5
	4.1 mm.	2.6 mm.	2.5 mm.	1.6 mm.	5

LYMNAEA TURRITELLA, new species. Plate 5, fig. C

Holotype.—Catalogue number 3807, Molluscan Collection, University of Kansas Museum of Natural History. Type and paratypes from type locality collected by C. W. Hibbard.

Horizon and type locality.—Blanco Formation (Nebraskan Age, Pleistocene). Fifteen miles east of Liberal (center W line, sec. 36, T. 34 S, R. 31 W), Seaward County, Oklahoma.

Diagnosis.—Shell characterized by small size, elongate, narrowly conic form, with 5 to 5½ turreted whorls, and small, oval aperture.

Description of holotype.—Shell small, narrowly conic, 5½ turreted whorls, which increase regularly in size, all whorls flattened and strongly shouldered above, except body whorl, which is slightly swollen and convex; suture deeply impressed; apex sub-acute; nuclear whorl small, subplanorbid; height of spire more than half that of shell; aperture elongate-oval; terminations of peristome connected by a thin callus across preceding whorl; peristome thin, simple along angular border, reflected along parietal part, sinuous, nearly covering narrow umbilical perforation; nuclear whorl finely granular, succeeding whorls with fine but distinct, vertical, raised striae that increase in coarseness toward body whorl; spiral sculpture absent.

	Height	Diameter	Aperture height	Aperture width	Number of whorls
Type	6.2 mm.	2.7 mm.	2.3 mm.	1.4 mm.	5½
Paratypes (no. 3808)	5.8 mm.	3.1 mm.	2.0 mm.	1.8 mm.	5
	5.9 mm.	2.8 mm.	2.6 mm.	1.7 mm.	5½
	5.4 mm.	2.6 mm.	2.4 mm.	1.5 mm.	5
	5.3 mm.	3.1 mm.	2.1 mm.	1.8 mm.	5

Comparisons.—*Lymnaea turritella* is smaller than most examples of *L. parva*, but is somewhat larger than *L. dalli*; and slendered than either *L. parva* or *L. dalli.* The turreted whorls of *L. turritella* are quite unlike those of any small species of *Lymnaea* known to me.

The name "*turritella*" is the diminutive form of the Latin word meaning tower, and is here applied in reference to the turreted spire of this fossil shell.

LYMNAEA MACELLA, new species. Plate 5, fig. J

Holotype.—Catalogue number 8804, Molluscan Collection, University of Kansas Museum of Natural History. Type and paratypes collected by A. B. Leonard and Alice E. Leonard.

Horizon and type locality.—Blanco Formation (Nebraskan

Age, Pleistocene). Nine miles south, 7 miles west of Meade (SW ¼ sec. 22, T. 33 S, R. 29 W), Meade County, Kansas.

Diagnosis.—Shell 7–9 mm. in height, rimate, with 5–6 moderately flat-sided whorls, the last greatly enlarged; spire acute but not attenuate; aperture narrowly ovate, with heavy varix within; aperture more than half as high as shell; surface sculpture of intersecting spiral and vertical lines.

Description of holotype.—Shell small, rimate, 5½ whorls, only slightly convex, except the last, which is moderately inflated; suture impressed but not deeply; nuclear whorl subplanorbid; aperture narrowly ovate and more than half as high as shell, acutely narrowed above, rounded below, outer lip of peristome with heavy varix, forming triangular ridge within, inner peristome nearly straight, slightly sinuous, reflected against preceding whorl, but not entirely closing umbilicus; nuclear whorl smooth, remaining whorls with numerous fine impressed undulating vertical lines, intersected by numerous fine, impressed, spiral lines.

Comparisons.—*Lymnaea macella* is unlike *L. parva* (of similar size) or the smaller *L. dalli; L. macella* seems to be related to *L. parexilis*, which it resembles in general form and in surface sculpture, but from which it differs in size, its total length being less than half that of *L. parexilis*, in heavier varix within the palatal portion of the peristome, and in larger, more nearly planorbid nuclear whorl.

	Height	Diameter	Aperture height	Aperture width	Number of whorls
Type	8.5 mm.	4.0 mm.	5.0 mm.	2.1 mm.	5½
Paratypes (no. 3766)	9.1 mm.	3.8 mm.	4.6 mm.	2.1 mm.	6
	8.4 mm.	3.5 mm.	4.6 mm.	1.9 mm.	5½
	8.8 mm.	3.7 mm.	5.0 mm.	2.2 mm.	5½
	8.7 mm.	4.0 mm.	5.1 mm.	2.1 mm.	5
	8.7 mm.	3.9 mm.	5.0 mm.	2.0 mm.	5½

The name "*macella*" is derived from the Greek word meaning "a single-pointed pick-axe," and is here applied in reference to the pointed spire and heavy shell.

LYMNAEA PAREXILIS, new species. Plate 5, fig. K

Holotype.—Catalogue number 8805, Molluscan Collection, University of Kansas Museum of Natural History. Type and paratypes collected by A. B. Leonard and Alice E. Leonard.

Horizon and type locality.—Blanco Formation (Nebraskan Age, Pleistocene). Nine miles south, 7 miles west of Meade (SW ¼ sec. 22, T. 33 S, R. 29 W), Meade County, Kansas.

Diagnosis.—Shell of medium size for the genus, of 6 (occasionally 7) whorls; slender in general form, with acute spire, nearly flat-sided whorls, and shallowly impressed suture; aperture elongate, narrow, its length less than that of spire; palatal peristome thickened within, parietal portion reflected over columella, closing umbilicus.

Description of holotype.—Shell medium in size for the genus, elongate spiral in form; whorls 6 in number, nearly flatsided, oblique, gradually increasing in length; suture not deeply impressed; spire attenuate, acute, body whorl elongate, only slightly inflated; aperture narrowly ovate, narrowing above, slightly produced below, length slightly less than height of spire; peristome thickened within; palatal lip convex, simple, parietal lip nearly straight, reflected against preceding whorl, closing umbilicus; 1½ nuclear whorls smooth, surface sculpture on succeeding whorls of coarse, raised, vertical growth striae, with fine, impressed wrinkled, parallel lines between them; fine, impressed, spiral lines intersect vertical lines, producing fabric-like surface.

Comparisons.—The shell of *Lymnaea parexilis* is similar in general form to that of *L. exilis,* but is much smaller with a relatively more elongate aperture, and more intricate sculpture. *Lymnaea parexilis* is slenderer, generally smaller, and its whorls are more nearly flat-sided than those of *L. palustris* or *L. reflexa.*

	Height	Diameter	Aperture height	Aperture width	Number of whorls
Type	18.2 mm.	5.2 mm.	8.8 mm.	3.2 mm.	6
Paratypes (no. 3786)	20.3 mm.	7.7 mm.	9.4 mm.	4.5 mm.	6
	20.0 mm.	6.4 mm.	9.2 mm.	3.7 mm.	7
	19.0 mm.	7.0 mm.	9.1 mm.	3.2 mm.	6
	18.2 mm.	5.2 mm.	8.8 mm.	3.2 mm.	6

The name of this species is given because it superficially resembles *Lymnaea exilis,* to which it seems to be related.

PROMENETUS BLANCOENSIS, new species. Plate 5, figs. D, E, F

Holotype.—Catalogue number 8802, Molluscan Collection, University of Kansas Museum of Natural History. Type and paratypes from type locality collected by C. W. Hibbard.

Horizon and type locality.—Blanco Formation (Nebraskan Age, Pleistocene). Seventeen miles south, 12 miles west of Meade (sec. 35, T. 34 S, R. 30 W), Meade County, Kansas.

Diagnosis.—A small planorbid shell, greater diameter slightly less than 4 mm.; ultra-dextral, broadly umbilicate, with 3–3½ gradually enlarging whorls, all visible above and below, aperture trianguloid, wider than high; surface sculpture of fine, oblique, transverse striae; spiral striae absent; many, but not all, shells irregularly banded with shades of tan and brown (figs. D, E.).

Description of holotype.—Shell small, planorbid, ultra-dextral, broadly umbilicate; spire sunken, all volutions visible above and below; 3¾ whorls, gradually increasing in size, slightly convex above, but shouldered near umbilicus, flattened to slightly excavate below, body whorl with broad, shallow excavation near midline above and below, extending backward from peristome for length of one-half volution; aperture trianguloid, width greater than height; peristome thin, simple, terminations half encircling preceding whorl, thin callus across parietal wall; nuclear whorl smooth, remaining whorls with fine, transversely oblique striae, giving the surface a silky texture; spiral striae absent, shell irregularly banded with shades of tan and brown.

Comparisons.—*Promenetus blancoensis* resembles *P. umbilicatellus,* from which it differs in its smaller size, lesser number of whorls (always less than 4), non-striate nucleus, absence of spiral sculpture, and depressed spire. If the shell was, indeed, colored in life with alternate bands of pigment, as the fossil shell strongly suggests, this is remarkable since color patterns among planorbids are rare.

	Height	Diameter (greater)	Aperture height	Aperture width	Number of whorls
Type	1.3 mm.	3.9 mm.	1.3 mm.	1.4 mm.	3¾
Paratypes (no. 3804)	1.1 mm.	3.9 mm.	1.0 mm.	1.5 mm.	3¾
	1.1 mm.	3.8 mm.	1.0 mm.	1.4 mm.	3¾
	1.2 mm.	3.7 mm.	1.1 mm.	1.3 mm.	3½
	1.1 mm.	3.8 mm.	1.0 mm.	1.2 mm.	3¾

The name of this species is derived from the name of the geological formation in which it has been found.

GYRAULUS ENAULUS, new species. Plate 5, figs. G, H, I

Holotype.—Catalogue number 8803, Molluscan Collection, University of Kansas Museum of Natural History. Type and paratypes from type locality collected by C. W. Hibbard.